Task / Low Ambient Lighting for Today's Offices

Five Key Findings from PIER – Finelite Research

Task Lighting Overview:
Task Lights add light and eliminate shadows

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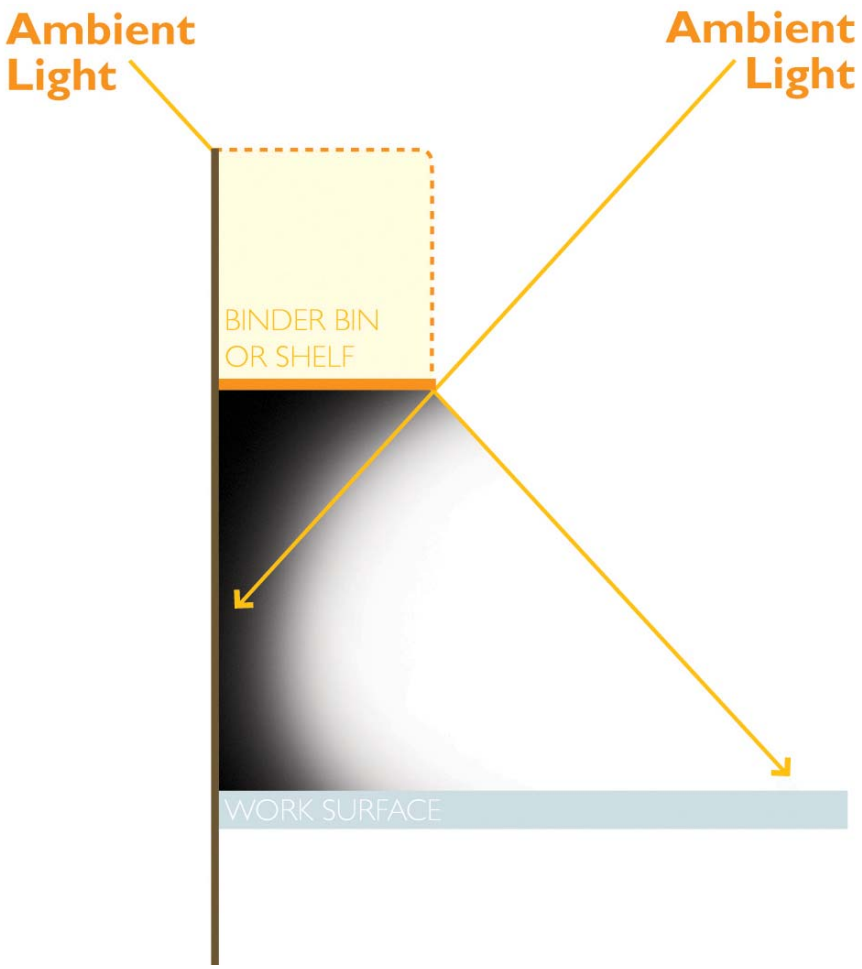

Within our work areas, shadows make us uncomfortable!

Task lighting needs to address this fact.

Undercabinet Luminaires

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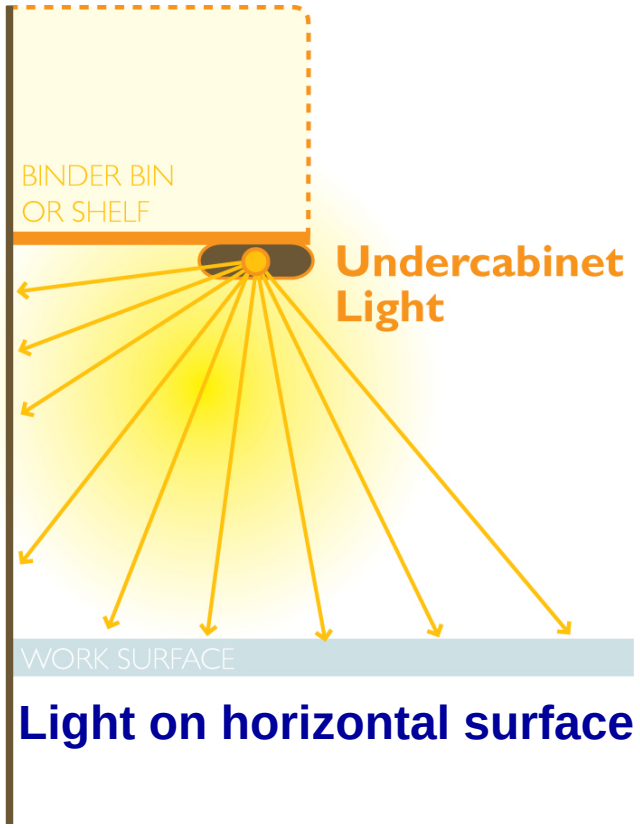

Light on vertical surface

Light on horizontal surface

1. Undercabinet lights need to eliminate shadows and add light where needed
2. Desk lamps add light

However, it appears users do not actually use undercabinet luminaires

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We estimate that approximately 80% of users turn OFF their Undercabinet Light!

What is going on?

Why? Too much light IS NOT good light

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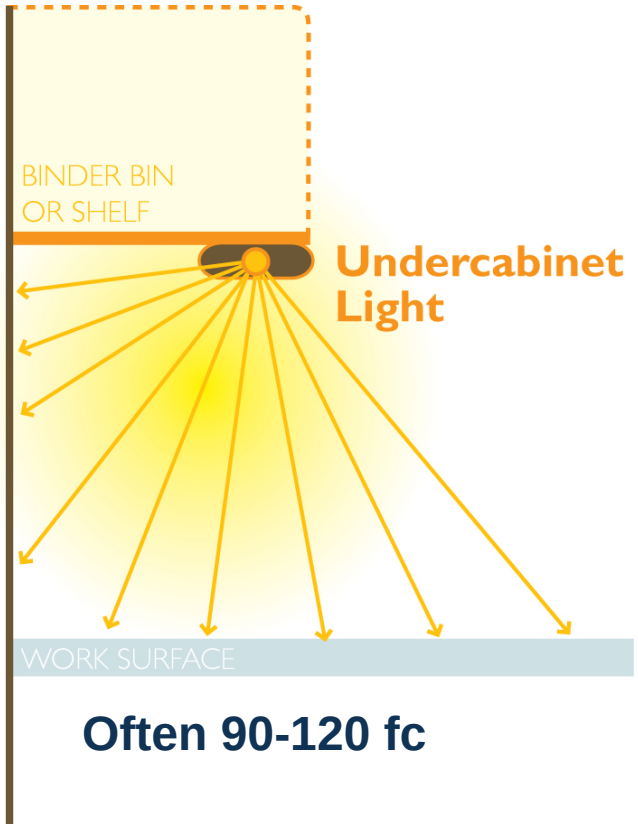
Often 100-200 fc



Often 90-120 fc

T8, T5 and even T2 undercabinet lights are putting nearly 3-times more light than is recommended on the surfaces!

What a choice: Unbearable or Uncomfortable

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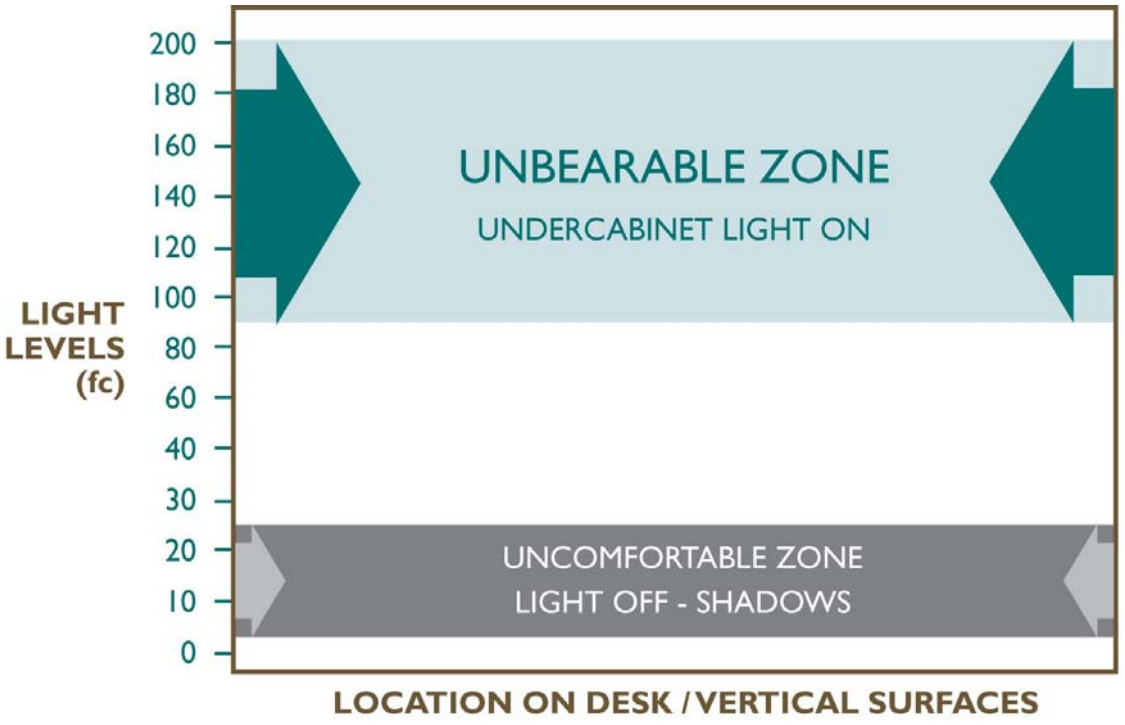

Over 80% of workers choose uncomfortable over unbearable

Why has this situation been tolerated?

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- If someone needs light, it is there
- Since most don't use the undercabinet task lighting, energy use is minimized
- Inertia:
  - No one is complaining
  - Its been that way for years
  - There are no risks associated with change
  - "It isn't broken. So, don't fix it"

PIER decided it was time to look deeper.

PIER focus to explore benefits from Task/Low Ambient

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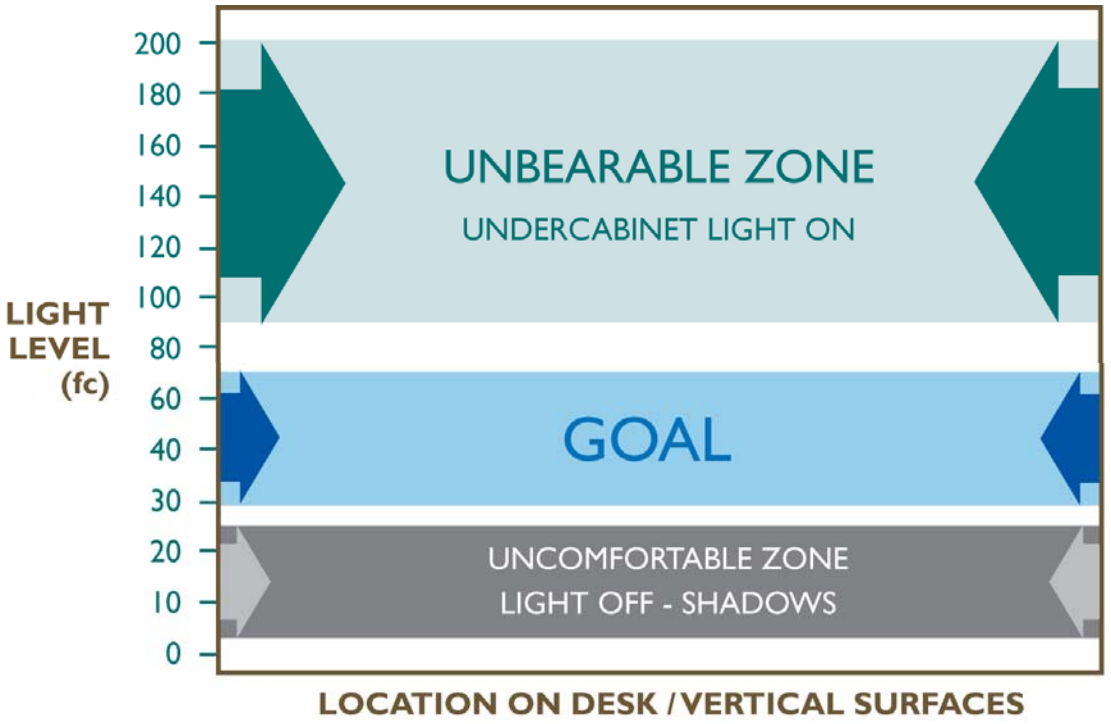

Task Lighting in the "GOAL" zone is the key to significant energy savings & user acceptance.

Better lighting is the RIGHT amount of light

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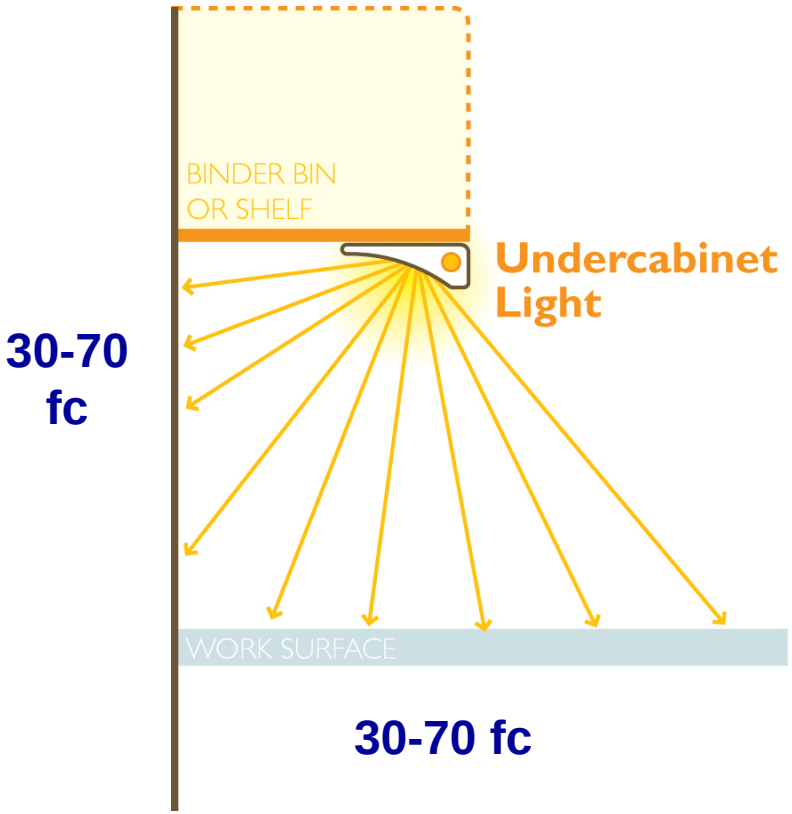

- Eliminate shadows using the right amount of light
- Ways to accomplish
  - Dim lamp
    - $$$
    - Limited energy savings
  - Mechanical block
    - $$
    - No energy savings
  - New white LED-based luminaire
    - $
    - Maximum energy savings

PIER, CLTC, & Finelite Develop a New LED-based Solution

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1. **Personal power supply**:

   3 Power Choices: 9W, 21W, 60W

2. **Undercabinet**:

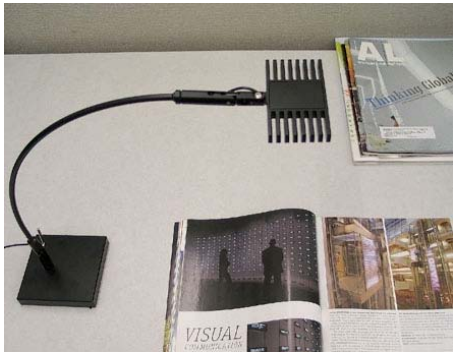
   Vertical brightness

   3 Types: 3W, 6W and 9W

   Latest LED technology

3. **Desk Lamp**:

   3 Types: 3W, 6W and 9W (LED – based)



4. **Control:**

Here is how it “Looks” in a lab set-up

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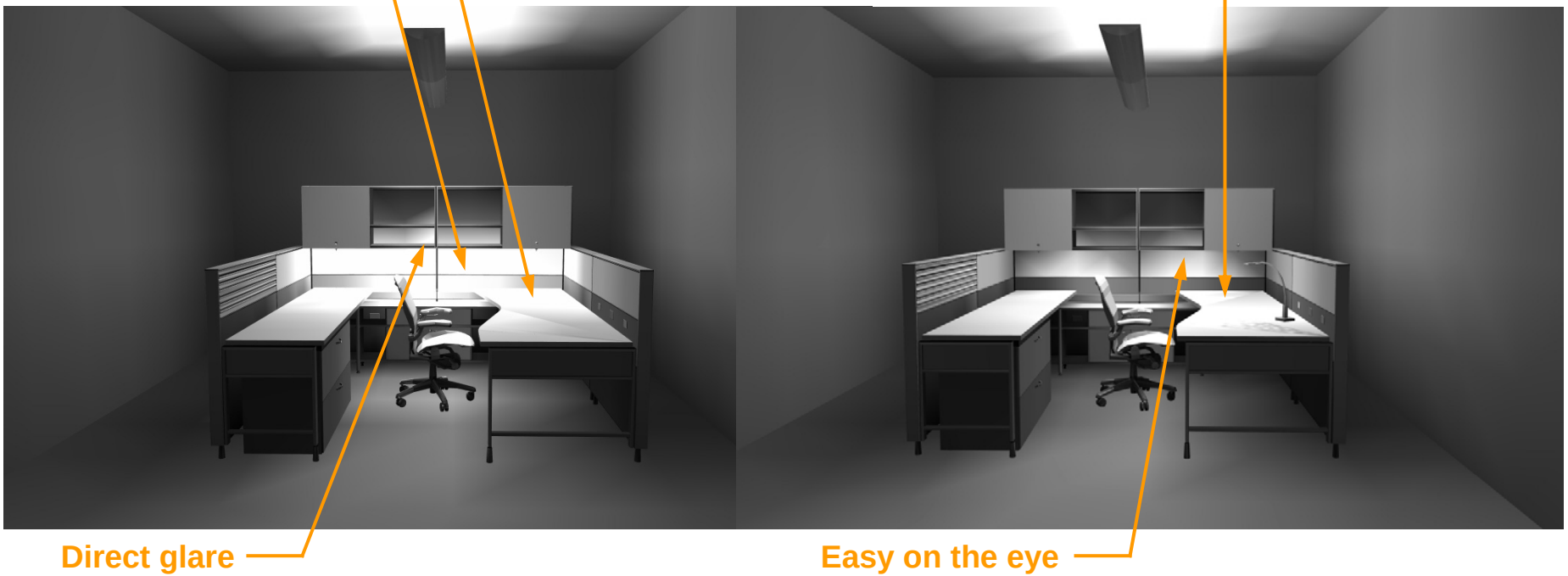

Current Situation

- Imbalance of room surface luminances
- Imbalance of light distribution on surfaces & task plane

The Solution

- Balanced room surface luminances
- Balanced light distribution on surfaces & task plane

Better Lighting: Layout #1

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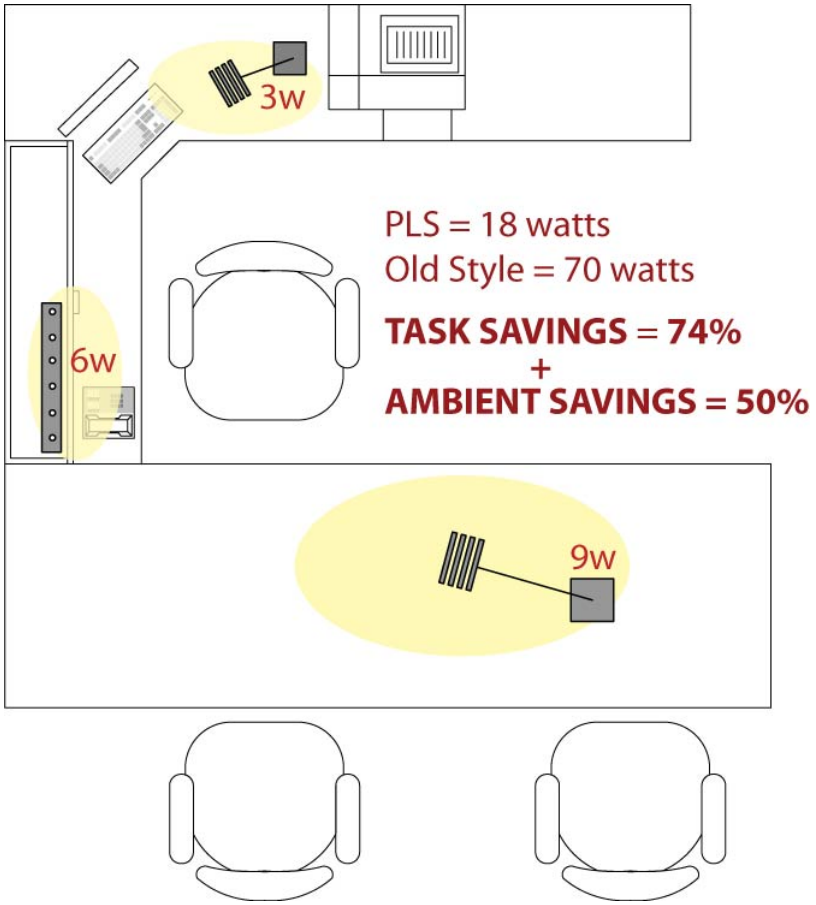

Better Lighting: Layout #2

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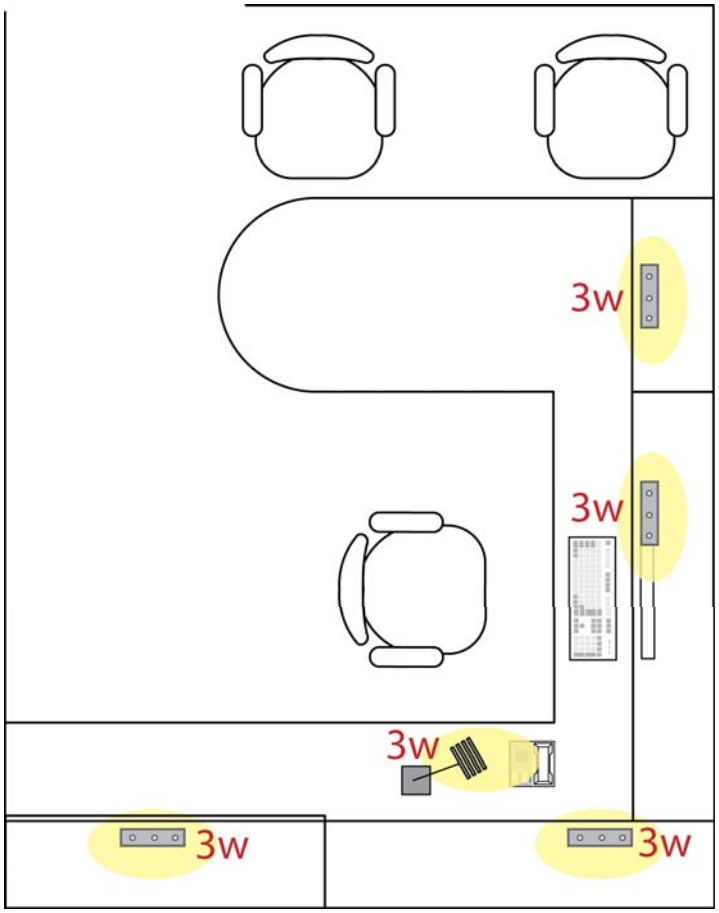

Personal Lighting System:

(4) 3W UC	=	12 W
(1) 3W DL	=	3 W
Total	=	15 W

9’ x 12’ Workstation = 108 sf

Task:	0.14 w/sf
Ambient:	0.49 w/sf
Task + Ambient:	0.63 w/sf

Better Lighting: Layout #3

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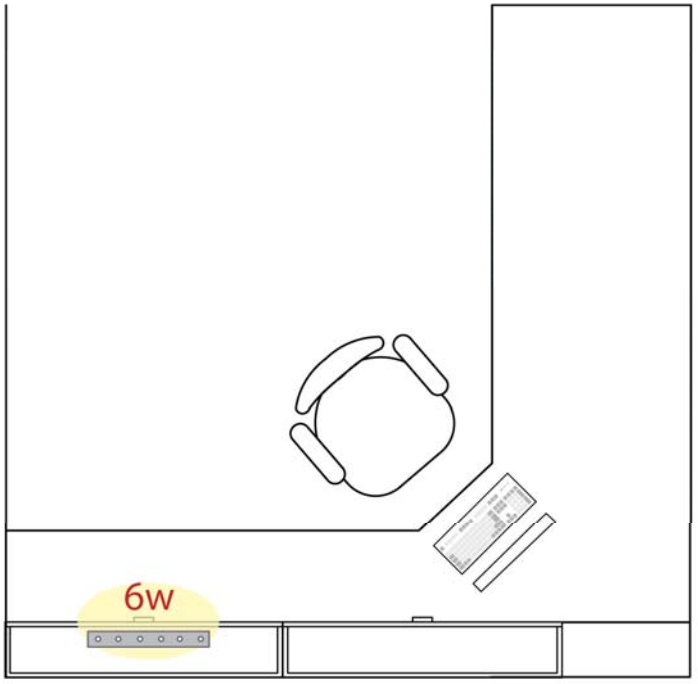

Personal Lighting System:

(1) 6W UC	= 6 W
Total	= 6 W

8’ x 8’ Workstation = 64 sf

Task:	0.09 w/sf
Ambient:	0.49 w/sf
Task + Ambient:	0.58 w/sf

Better Lighting: Layout #4

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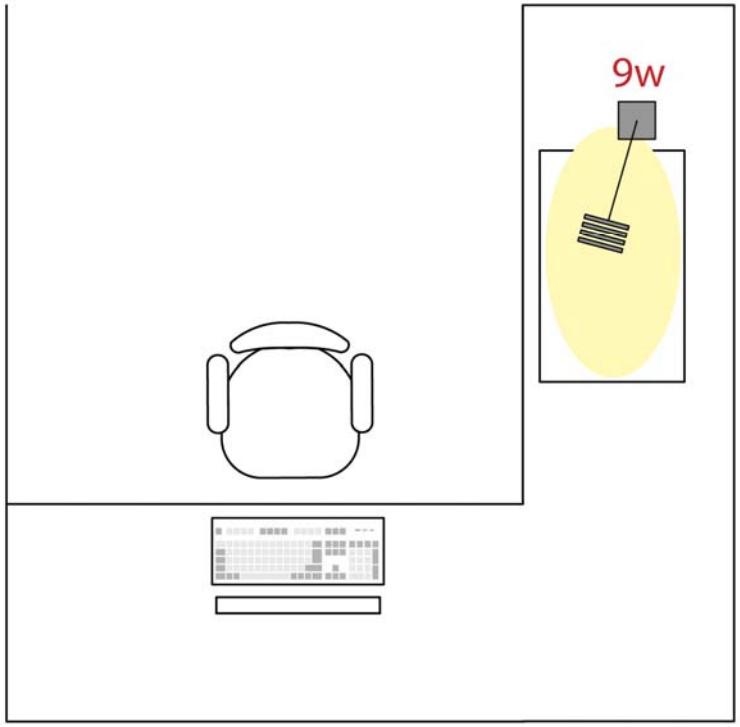

Personal Lighting System:

(1) 9W DL	**=**	**9 W**
Total	**=**	**9 W**

8’ x 8’ Workstation = 64 sf

Task:	**0.14 W/sf**
Ambient:	**0.45 W/sf**
Task + Ambient:	**0.59 W/sf**

When the Task Lighting is Right, Ambient Lighting Takes Only 0.5 to 0.65 W/sf

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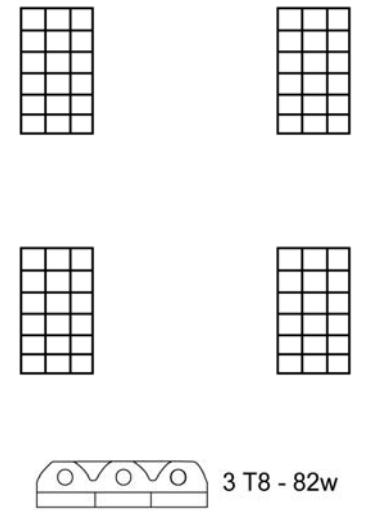
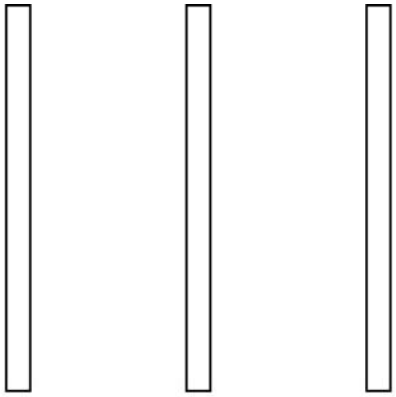
This no longer works!



Parabolic Spacing	Watts (BF)	ft²	w/ft²
10´x14´	82 (0.88)	140	0.59
12´x14´	82 (0.88)	168	0.49

Parabolic
NO

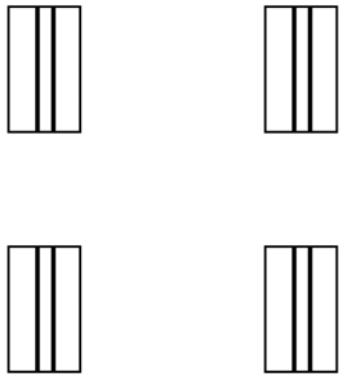
This works!



Row Spacing	Watts (BF)	ft²	w/ft²
10´	48 (0.78)	80	0.60
12´	55 (0.88)	96	0.57
14´	55 (0.88)	112	0.49

Linear
YES

This works!



HER Spacing	Watts (BF)	ft²	w/ft²
10´x10	60 (0.88)	80	0.60
10´x12	60 (0.88)	96	0.50

High Efficiency
YES

The Big Win: Use Task/Low Ambient for Big Savings

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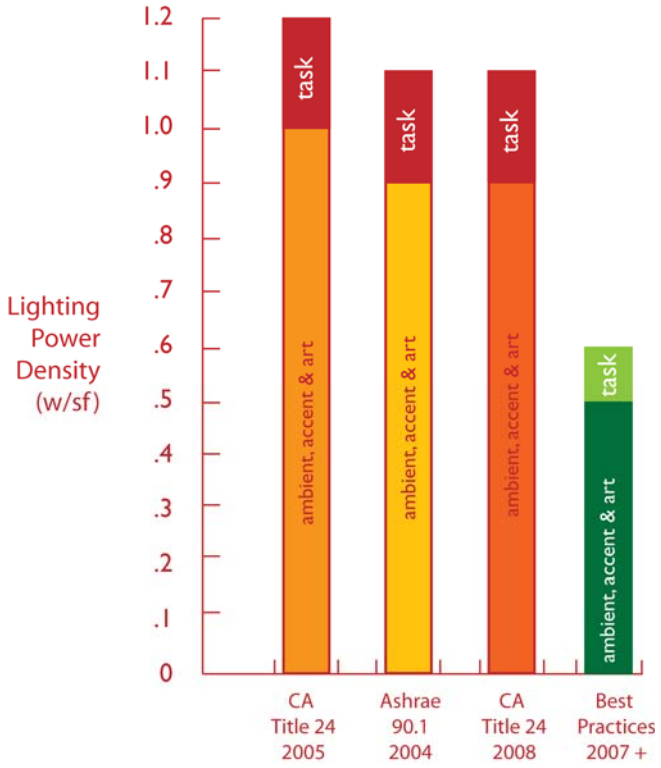

Best Practices =

45% Savings

over ASHRAE 90.1 and CA Title 24 2008

CEC-PIER — Finelite Research: Finding #1

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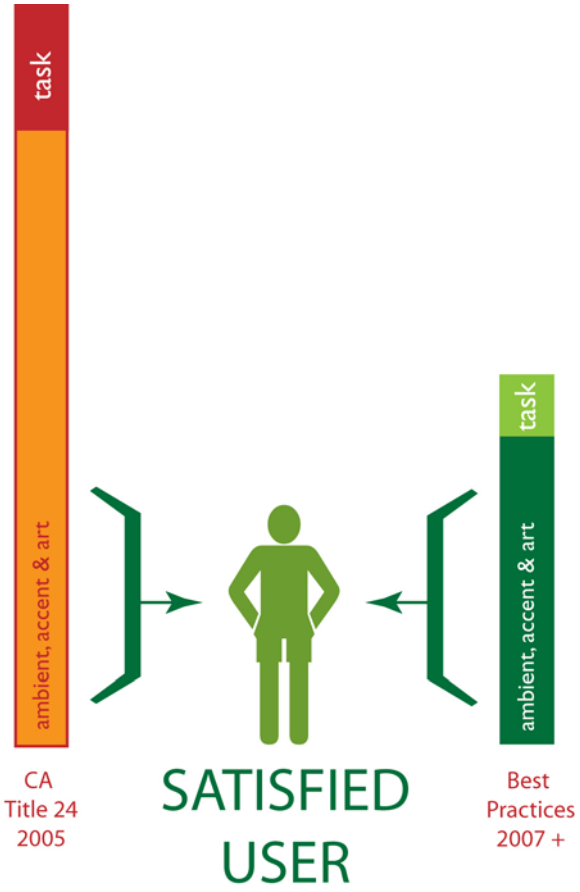

- The quality of task lighting directly effects the amount of ambient lighting that is needed to light offices

Finding # 2: Poor Task Lighting is Expensive!

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1. Energy is wasted

2. The designs are not sustainable
   - Too many ambient lamps, ballasts, luminaires
   - Higher first cost
   - Higher life cycle cost

3. Poor user acceptance

Finding #3: Task/Low Ambient is Affordable

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	2008 CA Title 24	Task / Low Ambient	IMPACT
UC Task $/sf	$0.75	$1.07	($0.32) extra cost
Ambient $/sf	$4.20	$2.33	**$1.87 savings**
Total $/sf	$4.95	$3.40	**$1.55 savings**
Total LPD	1.1 W/sf	0.6 W/sf	**0.5 W/sf 45% savings**
$/kWh	$0.17		
Op Hrs / Yr	2808		
Op $ / Yr	$0.53/sf	$0.29/sf	**$0.24/sf savings**

Finding #3 Means: Task/Low Ambient has Fast Payback

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- New Construction
  - Costs less!
  - Saves $0.24/sf in annual energy costs
- Retrofit
  - Simple de-lamp from 1.1 W/sf LPD
    - Less than 5 years!
  - Simple de-lamp from 1.5 W/sf LPD
    - Less than 2.5 years!

Finding #4: Task/Low Ambient Lighting Works

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Finding #5: Task/Low Ambient Act Now

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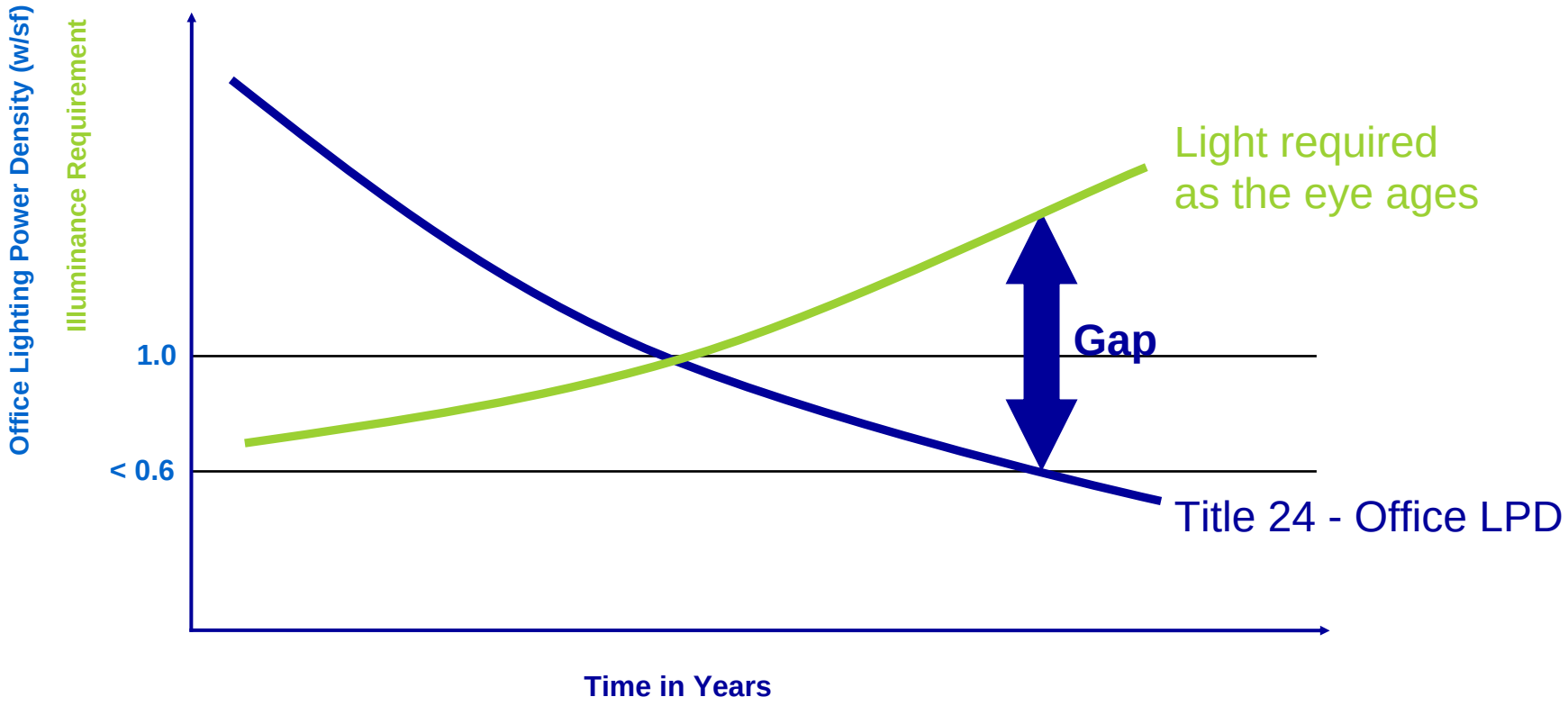

For More Information

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- Look for CEC-PIER Final Report:

  Integrated Office Lighting Solution – Personal Lighting System

- Visit www.cltc.ucdavis.edu
  - Projects ➡ Research ➡ IOLS-PLS

- Visit www.finelite.com